

---

**C004 & M004: COLD WEATHER AND MOUNTAIN MEDICAL CONSIDERATIONS**

---

TSP Number/Title	C004 & M004: Cold Weather and Mountain Medical Considerations
Effective Date	Implement next class iteration upon receipt
Supersedes TSP(s)/Lessons	None
TSP User	The following courses use this TSP: Cold Weather Instructor Qualification Course (CWIQC) Command and Staff Orientation Course (CSOC) Cold Weather Leaders Course (CWLC) Mountain Instructor Qualification Course (MIQC) Basic Mountaineering Course (BMC) Assault Climbers Course (ACC)
Proponent	United States Army Alaska, Northern Warfare Training Center
Improvement Comments	Send comments and recommendations on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to:  ATTN: TRAINING ADMINISTRATOR COMMANDANT USARAK NWTC 1060 GAFFNEY ROAD #9900 FORT WAINWRIGHT AK 99703-9900
Security Clearance/Access	Public domain
Foreign Disclosure Restrictions	The Lesson Developer in coordination with the USARAK NWTC foreign disclosure authority has reviewed this lesson. This lesson is releasable to foreign military students from all requesting foreign countries with Approval of Commandant USARAK NWTC.

## PREFACE

**Purpose** This training support package provides the instructor with a standardized lesson plan for presenting instruction for:

Task Number	Task Title
IV.0100	Cold Weather and Mountain Medical Considerations

**Technique of Delivery**

Lesson Number	Instructional Strategy	Media
C004 & M004	Platform Instruction	PowerPoint

**This TSP contains**

Table of Contents		Page
Lesson	Section I, Administrative Data	3
	Section II, Introduction	5
	TLO: Demonstrate knowledge of medical problems commonly encountered in cold weather/mountain environments, their preventive measures and treatment, and nutritional and hygienic requirements for health maintenance	5
	Section III, Presentation	9
	ELO A: Describe the general characteristics of cold weather and mountainous environments	9
	ELO B: Describe how the body loses heat	12
	ELO C: Describe the body response to the cold weather environment	13
	ELO D: Identify individual factors that make can make a soldier more/less susceptible to cold weather injuries	14
	ELO E: Describe the food, water and personal hygiene requirements for the cold weather and mountainous environments	15
	ELO F: Define dehydration and describe the prevention, symptoms, and treatment of dehydration	18
	ELO G: Define hypothermia and describe the prevention, symptoms, and treatment of hypothermia	19
	ELO H: Define chilblain and describe the prevention, symptoms, and treatment of chilblain	20
	ELO I: Define frostbite and describe the prevention, symptoms, and treatment of frostbite	21
	ELO J: Define immersion foot and describe the prevention, symptoms, and treatment of immersion foot	27
	ELO K: Define snowblindness and describe the prevention, symptoms, and treatment of snowblindness	30
	ELO L: Define carbon monoxide poisoning and describe the prevention, symptoms, and treatment of carbon monoxide poisoning	31
	ELO M: Define altitude illness	32
	ELO N: Define commonly used altitude classifications	33
	ELO O: Define the relationship between altitude and oxygen available to the human body	34
	ELO P: Describe the initial physiological response to altitude	35
	ELO Q: Describe the acclimatization process	36
	ELO R: Define acute mountain sickness and describe the prevention, symptoms, and treatment of acute mountain sickness (AMS)	37
	ELO S: Define High Altitude Pulmonary Edema (HAPE) and describe the prevention, symptoms, and treatment of HAPE	38

	ELO T: Define High Altitude Cerebral Edema (HACE) and describe the prevention, symptoms, and treatment of HACE	39
	ELO U: Describe the Gamow bag and how it can be used to treat altitude sickness	40
	ELO V: List tips for successful operations at altitude	41
	ELO W: Define giardia and describe the prevention, symptoms and treatment for giardia	42
	ELO X: Define constipation and describe the prevention, symptoms and treatment for constipation	43
	ELO Y: Define heat exhaustion and describe the prevention, symptoms and treatment for heat exhaustion	44
	ELO Z: Define heat stroke and describe the prevention, symptoms and treatment for heat stroke	45
	ELO AA: Define hyponatremia and describe the prevention, symptoms and treatment for hyponatremia	46
	Section IV: Summary	47
	Section V: Student Evaluation	49

---

**C004 & M004: COLD WEATHER AND MOUNTAIN MEDICAL CONSIDERATIONS**

---

**SECTION I ADMINISTRATIVE DATA****All courses including this lesson**

Course Number(s)	Course Title (s)
	Cold Weather Instructor Qualification Course (CWIQC)
	Command and Staff Orientation Course (CSOC)
	Cold Weather Leaders Course (CWLC)
	Mountain Instructor Qualification Course (MIQC)
	Basic Mountaineering Course (BMC)
	Assault Climbers Course (ACC)

**Task(s) Taught or Supported**

Task Number	Task Title
I.0100	Cold Weather and Mountain Medical Considerations

**Task(s) Reinforced**

N/A

**Test Lesson Number**

Hours	Lesson Number	Lesson Title
1	M021	Cold Weather Written Test (Winter) or Mountain Written Test (Summer)

**Prerequisite Lesson(s)**

None

**References**

Number	Title	Date	Additional Information
	NWTC Cold Weather Operations Manual	FY04	Updated yearly
	NWTC Mountain Operations Manual	FY04	Updated yearly
FM 31-70	Basic Cold Weather Manual	1968	<a href="http://www.adtdl.army.mil/">http://www.adtdl.army.mil/</a>
FM 31-71	Northern Operations	1971	<a href="http://www.adtdl.army.mil/">http://www.adtdl.army.mil/</a>
FM 3-97.6	Mountain Operations	November 2000	<a href="http://www.adtdl.army.mil/">http://www.adtdl.army.mil/</a>
FM 3-97.61	Military Mountaineering	August 2002	<a href="http://www.adtdl.army.mil/">http://www.adtdl.army.mil/</a>
Wilkerson MD, James A.	Medicine for Mountaineering, 5 <sup>th</sup> Edition		

<b>Student Study Assignment</b>	<b>Students should read TSP C004 &amp; M004</b>										
<b>Instructor Requirements</b>	<b>MIQC or CWIQC graduate; TAITC graduate</b>										
<b>Additional Support Personnel Requirements</b>	<b>One assistant to run PowerPoint slide show.</b>										
<b>Equipment Required</b>	<b>Computer with proxima capable of running PowerPoint presentations.</b>										
<b>Materials Required</b>	<b>Instructor Materials: Platform Guidebook for C004 &amp; M004;</b> <b>Student Materials: NWTC Mountain or Cold Weather Operations Handbook</b>										
<b>Classroom, Training Area and Range Requirements</b>	<b>Classroom</b>										
<b>Ammunition Requirements</b>	<b>None</b>										
<b>Instructional Guidance</b>	<b>Before presenting this lesson, instructors must thoroughly prepare by studying this lesson and identified reference material.</b>										
<b>Branch Safety Manager Approval</b>	<table border="1"> <tr> <td><b>NAME</b></td> <td><b>Rank</b></td> <td><b>Position</b></td> <td><b>Date</b></td> </tr> <tr> <td>Mark Gilbertson</td> <td>GS-09</td> <td>Training Specialist</td> <td></td> </tr> </table>	<b>NAME</b>	<b>Rank</b>	<b>Position</b>	<b>Date</b>	Mark Gilbertson	GS-09	Training Specialist			
<b>NAME</b>	<b>Rank</b>	<b>Position</b>	<b>Date</b>								
Mark Gilbertson	GS-09	Training Specialist									
<b>Proponent Lesson Plan Approvals</b>	<table border="1"> <tr> <td><b>NAME</b></td> <td><b>Rank</b></td> <td><b>Position</b></td> <td><b>Date</b></td> </tr> <tr> <td>Peter Smith</td> <td>GS-12</td> <td>Training Administrator</td> <td></td> </tr> </table>	<b>NAME</b>	<b>Rank</b>	<b>Position</b>	<b>Date</b>	Peter Smith	GS-12	Training Administrator			
<b>NAME</b>	<b>Rank</b>	<b>Position</b>	<b>Date</b>								
Peter Smith	GS-12	Training Administrator									

**SECTION II****INTRODUCTION**

**Method of Instruction:** Platform  
**Instructor to student ratio:** 1:75 (maximum)  
**Time of instruction:** 50 minutes  
**Media:** Computer with proxima

---

**Motivator**

# ***Cold Weather and Mountain Medical Considerations***

*Reference NWTC Cold Weather or Mountain Operations Manual, C004 & M004*

Most experts when asked the question concerning cold weather operations will tell you that you must learn to survive in the cold weather environment before you can learn to fight in it. Military history has proven this again and again. Cold weather introduces an entirely new dimension to the battlefield which is basic human survival. An understanding of the challenges of operating in the cold weather and unit and soldier needs in the cold weather environment will go a long way to ensuring that soldiers are not lost to preventable injuries. These challenges and needs must be understood before tacticians can begin making training or operational plans.

**Terminal Learning  
Objective**

<b>ACTION</b>	Demonstrate knowledge of medical problems commonly encountered in cold weather/mountain environments, their preventive measures and treatment, and nutritional and hygienic requirements for health maintenance
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Demonstrate knowledge of medical problems commonly encountered in cold weather/mountain environments, their preventive measures and treatment, and nutritional and hygienic requirements for health maintenance IAW this presentation.

---

**Safety  
Requirements**

**None**

---

**Risk Assessment  
Level**

**Low**

---

**Environmental  
Considerations**

**None**

---

**Evaluation**

Students will be evaluated on the comprehension of lesson material by a written test.

---

**Instructional  
Lead-in**

(Slide 2)

- Frozen Russian soldier: WWII
- World War I: In one British Operation into Turkey, a supply officer decided not to take cold weather gear. On November 27th, when they deployed into action 200 soldiers froze to death and there were 5,000 cases of frostbite.
- On the Austro-Italian Alps 60,000 casualties were due to cold weather (one third of the total – another third was from avalanche deaths).
- World War II: US Army suffers 90,000 cold weather casualties
- Korea: US Army suffers 10,000 cold weather casualties
- Falklands: British Army suffers 777 casualties – 109 of those are cold weather injuries



## ***Cold Weather and Mountain Medical Considerations***

- **Individual Care in a Cold or Mountainous Environment**
  - Environmental Factors
  - Heat Loss
  - Body Response to the Cold Weather Environment
  - Individual Factors
  - Food and Water Requirements
  - Personal Hygiene
- **Cold Weather Injuries**
  - Recognition
  - Symptoms
  - Treatment
  - Prevention
- **Altitude Sickness**
  - Recognition
  - Symptoms
  - Treatment
  - Prevention



## ELO A

<b>ACTION</b>	Describe the general characteristics of cold weather and mountainous environments
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Describe the general characteristics of cold weather and mountainous environments IAW the NWTC Cold Weather or Mountain Operations Handbook and FM 3-97.6 Mountain Operations.

## Learning Step/Activity 1 – Environmental Factors

a. (Slide 4) **These are some of the things you already learned about in the Characteristics of the Cold Weather/Mountainous Environment.**

**Severe, unpredictable weather and extreme temperatures:** reference the Characteristics of Cold Weather Environments platform class.

**Humidity Wet Cold vs. Dry Cold:** The amount of moisture in the air. The higher the humidity the harder it is to stay warm or cool. Wet Cold and Dry Cold are discussed in Individual Clothing and Equipment platform class.

**Altitude:** for every 1000 feet gained in elevation, ambient temperature drops 3-5 degrees F. and relative humidity drops. At higher altitudes, adverse reactions can occur in the body. This will be discussed later.

**Wind Chill:** The combined cooling effect of ambient temperature and wind velocity on a surface.

## ***Environmental Factors***

**Severe, unpredictable weather**

**Extreme temperatures**

**Humidity – Wet Cold vs. Dry Cold**

**Altitude**

**Wind Chill - The combined cooling effect of ambient temperature and wind velocity on a surface**

b. (Slide 5) The Wind Chill Matrix

<b>Wind Chill Chart</b>																				
<b>AIR TEMPERATURE IN FAHRENHEIT</b>																				
<b>WIND SPEED</b>	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45		
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63		
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72		
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77		
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81		
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84		
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87		
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89		
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91		
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93		
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95		

$WCT (^{\circ}F) = 35.74 + 0.6215T - 35.75(V0.16) + 0.4275T(V0.16)$   
 Where T is temperature ( $^{\circ}F$ ) and V is wind speed (mph)

WIND SPEED BASED ON MEASURES AT 33 FEET HEIGHT. IF WIND SPEED MEASURED AT GROUND LEVEL, MULTIPLY BY 1.5 TO OBTAIN WIND SPEED AT 33 FEET IN HEIGHT AND THEN UTILIZE CHART.

c. (Slide 6) This chart describes the time it will take for frostbite to occur on unprotected skin at a given wind chill temperature.

<b>Risk Of Frostbite</b>															
<b>AIR TEMPERATURE IN FAHRENHEIT</b>															
<b>WIND SPEED</b>	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45			
5	>2H	>2H	>2H	>2H	31	22	17	14	12	11	9	8			
10	>2H	>2H	>2H	28	19	15	12	10	9	7	7	6			
15	>2H	>2H	33	20	15	12	9	8	7	6	5	4			
20	>2H	>2H	23	16	12	9	8	6	5	4	4	4			
25	>2H	42	19	13	10	8	7	6	5	4	4	3			
30	>2H	28	16	12	9	7	6	5	4	4	3	3			
35	>2H	23	14	10	8	6	5	4	4	3	3	2			
40	>2H	20	13	9	7	6	5	4	3	3	2	2			
45	>2H	18	12	8	7	5	4	4	3	3	2	2			
50	>2H	16	11	8	6	5	4	3	3	2	2	2			

**GREEN-LITTLE DANGER** (frostbite occurs in >2H in dry exposed skin)  
**YELLOW - INCREASED DANGER** (frostbite could occur in 45 minutes or less in dry, exposed skin)  
**RED- GREAT DANGER** (frostbite could occur in 5 minutes or less in dry exposed skin)

Time to occurrence of frostbite in the most susceptible 5% of personnel.  
 Wet skin could significantly decrease the time for frostbite to occur

d.(Slide 7) This is guidance put forth by the US Army medical community. It recommends clothing and exposure times for personnel operating in the three temperature ranges described on the last slide and performing various types of work.

## **Windchill Category**

<b>Work Intensity</b>	<b>Little Danger</b>	<b>Increased Danger</b>	<b>Great Danger</b>
<b>High</b> Digging foxhole, running, marching with rucksack, making or breaking bivouac	Increased surveillance by small unit leaders; Black gloves optional - mandatory below 0°F (-18°C);	ECWCS or equivalent; Mittens with liners; No facial camouflage; Exposed skin covered and kept dry; Rest in warm, sheltered area; Vapor barrier boots below 0°F (-18°C) Provide warming facilities	Postpone non-essential training; Essential tasks only with <15 minute exposure; Work groups of no less than 2; Cover all exposed skin, Provide warming facilities
<b>Low</b> Walking, marching without rucksack, drill and ceremony	Increased surveillance; Cover exposed flesh when possible; Mittens with liner and no facial camouflage below 10°F (-12°C); Full head cover below 0°F (-18°C). Keep skin dry - especially around nose and mouth.	Restrict Non-essential training; 30-40 minute work cycles with frequent supervisory surveillance for essential tasks. See above.	Cancel Outdoor Training
<b>Sedentary</b> Sentry duty, eating, resting, sleeping, clerical work	See above; Full head cover and no facial camouflage below 10°F (-12°C); Cold-weather boots (VB) below 0°F (-18°C); Shorten duty cycles; Provide warming facilities	Postpone non-essential training; 15-20 minute work cycles for essential tasks; Work groups of no less than 2 personnel; No exposed skin	Cancel Outdoor Training

*These guidelines are generalized for worldwide use. Commanders of units with extensive extreme cold-weather training and specialized equipment may opt to use less conservative guidelines.*

---

**ELO B**

<b>ACTION</b>	Describe how the body loses heat
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Describe how the body loses heat IAW the Cold Weather or Mountain Operations Handbook.

---

Learning Step/Activity 1 – How does the body lose heat?

a. (Slide 8)

(1) Radiation: The normal loss of body heat to the surrounding air. This is direct energy emission from normal metabolic processes. Clothing manufacturers have tried to create clothing that captures this lost heat without much success. You cannot do much about this form of heat loss.

(2) Convection: Loss of heat to the air as colder air is heated by warmer skin. This loss is negligible at normal temperatures, but the amount of heat extracted by moving air increases as the square of velocity – A wind of 8 mph extracts 4 times as much heat as a wind of 4 mph. Again, the proper use, care and wear of your clothing will prevent this form of heat loss.

(3) Conduction: the transfer of heat from direct contact of a warmer object with a colder object. Proper application of the principles from the clothing class will prevent this type of heat loss.

(4) Respiration: Loss of body heat (and water loss) through breathing.

(5) Evaporation: Perspiration on the skin converting from a liquid to a gas.

## ***How does the body lose heat?***

**Radiation - 60%**

**Convection - variable**

**Conduction - variable**

**Respiration - 6% - 10%**

**Evaporation - 12% - 15%**

<b>ELO C</b>	<b>ACTION</b>	Describe the body response to the cold weather environment
	<b>CONDITION</b>	In a classroom environment
	<b>STANDARD</b>	Describe the body response to the cold weather environment IAW the Cold Weather or Mountain Operations Handbook.

#### Learning Step/Activity 1 – Body Response to the Cold Weather Environment

a. (Slide 9) This is how the body will respond to heat loss:

**(1) SHELL/CORE EFFECT:** The body will pull blood from the extremities into the core of the body (torso) in order to ensure that critical systems stay at the proper temperature. There may be some shivering which is the body's attempt to generate heat from muscular exertion. This is the time to ensure clothing is dry, eat, exercise and drink water.

**(2) COLD DIURESIS:** This results from the shell/core effect. As more blood is brought into the core, the kidneys sense an increase in fluid volume and proceed to produce more urine in an effort to get rid of it. The result can be dehydration without the soldier ever feeling thirsty.

### ***Body Response to the Cold Weather Environment***

Shell/Core Effect – body pulls blood from extremities in an effort to keep the core warm.

Cold Diuresis – result of the shell/core effect; body rids itself of fluid (increased urination), because the kidneys sense an increase of volume in the core; thirst mechanism is also disrupted

<b>ELO D</b>	<b>ACTION</b>	Identify individual factors that make can make a soldier more/less susceptible to cold weather injuries
	<b>CONDITION</b>	In a classroom environment
	<b>STANDARD</b>	Identify individual factors that make can make a soldier more/less susceptible to cold weather injuries IAW the Cold Weather or Mountain Operations Handbook.

#### Learning Step/Activity 1 – Individual Factors

a. (Slide 10) **These are the individual factors that may increase or decrease susceptibility to cold weather injuries:**

- (1) **Age:** The very old and young are more at risk.
- (2) **Discipline, Training and Experience** go hand in hand. You have to get out in the elements and apply the techniques you have learned to gain the experience required to trust in yourself and your equipment.
- (3) **Drugs** to include OTC drugs, tobacco and alcohol contain substances that may exacerbate or mask signs of cold weather injuries.
- (4) **Previous Injuries:** Once tissue has been damaged, it will often be more at risk for re-injury.
- (5) **Geographic Origin:** Persons acclimated to warmer environments are unaccustomed to the cold.
- (6) **Psychosocial Factor:** Persons who are unfamiliar with a colder climate are often afraid or nervous about the cold and develop preconceived notions about the arctic environment that beats them down mentally.
- (7) Excessive **Fatigue** decreases the amount of energy available, leads to dehydration and finally to cold weather injuries.
- (8) **Activity:** The more active you are the less susceptible to cold weather injuries you will be; sedentary duties (e.g. guard duty) may be difficult to sustain for long periods.
- (9) **Nutrition:** We will discuss this in a moment.
- (10) **Other injuries/illnesses:** Persons with poor circulation, diabetes, or other heredity problems are more at risk for injury.
- (11) Leaders have a tendency to overwork themselves and often fail to get enough food, water or rest. Dehydration and hypoglycemia (low blood sugar) and failure to get enough rest are three factors that often combine to sideline leadership.
- (12) Of all the factors listed, experience is the one area that no amount of indoor training can replace; until the individual gets into the cold weather environment he or she will not know the little things that will prevent him or her from becoming a cold weather injury.

### ***Individual Factors***

**Age**

**Geographic Origin**

**Discipline**

**Psycho-Social Factor**

**Training**

**Fatigue**

**Experience**

**Activity**

**Drugs**

**Nutrition**

**Previous Cold Injuries**

**Other Injuries**

ELO E	<b>ACTION</b>	Describe the food, water and personal hygiene requirements for the cold weather and mountainous environments
	<b>CONDITION</b>	In a classroom environment
	<b>STANDARD</b>	Describe the food, water and personal hygiene requirements for the cold weather and mountainous environments IAW the Cold Weather or Mountain Operations Handbook.

#### Learning Step/Activity 1 – Food and Water Requirements

a. (Slide 11)

(1) **Food Intake:** The human body while climbing or operating in an extreme cold weather environment is under great exertion and requires a larger amount of food (upwards of 6000 calories per day), to compensate for the energy expended. In a study conducted by NATICK the following was determined:

- USARIEM and S&TD conducted a field test at the Marine Mountain Warfare Training Center in Bridgeport California. The purpose of the test was to validate and improve the ability of the regression models in order to accurately predict energy and water requirements of soldiers performing various workloads at modest altitudes. Data was compared on body composition, nutrient intake, resting energy expenditure, aerobic fitness, and expenditure while hiking. SusD provided food components from Meal, Ready-to-Eat, Ration Cold Weather and Food Packet, Long Range Patrol rations along with 30 commercial products. Testing the rations was a group comprised of 11 members of a Special Forces Military Intelligence Detachment and nine U.S. Marine Combat Engineers.
- Each soldier was free to select their own food components. An accurate record was kept of what each soldier selected and consumed so that an exact energy input could be compared to energy expenditure data. The average caloric intake for the soldier was 2,710 kcal per day while the average energy expenditure was 5,576 kcal per day. **The approximate 2,500 kcal per day energy deficit was typical for field training exercises.** This demonstrates the importance of adequate body fat reserves and adequate carbohydrate consumption during exercise. The tests further showed that the equations used in the program provided an accurate estimate of energy expenditure over rugged terrain. Thus, soldiers will be provided with a menu of preferred food components that will enhance performance for various SOF mission scenarios.

(2) **Fats and Proteins:** MRE's do not contain enough to sustain mountain or cold weather training.

(3) **Hot Meals:** Hot meals are good for morale, increase body temperature, and aid in digestion; on the other hand you must use valuable water for cooking and carry extra equipment.

(4) **Vitamins:** extra vitamins are not required when eating the provided diet.

(5) **Water:** The body requires 3.5-5 quarts of water per day.

## ***Food and Water Requirements***

***Calories – 4500-6,000 calories  
per day***

***Fats and proteins***

***Hot meals***

***Vitamins***

***3.5-5 quarts of water per day***

9



a. (Slide 12) Good personal hygiene can go a long way towards preventing cold weather/mountain injuries:

(1) Washing is essential and can help soldiers and leaders identify minor injuries that can become bigger problems if left untreated. A warming shelter is generally needed for this. Shaving should be conducted prior to a rest cycle, so that oils stripped during shaving have a chance to be replenished prior to operating in the cold again.

(2) Water sources (snow, rivers lakes etc.) should always be considered suspect and treated, filtered or boiled (just to a rolling boil – once it comes to a boil everything in it is dead).

(3) Food Sources – hot meals and liquids can improve morale, aid digestion and make it easier to pack in needed calories.

(4) Nicotine is a vasoconstrictor and can exacerbate the shell/core effect. Alcohol is equally bad.

(5) Latrines should be constructed downwind for every three or four tents or platoon sized organization. Pit or cross tree type are preferable. The toilet should be wind proofed and camouflaged. A separate urinal can also be constructed.

(6) Clothing/sleeping bags have been discussed; overdressing in the cold weather environment can lead to cold weather injuries (sweat soaked) or heat injuries (dehydration). Overdressing inside a sleeping bag can also lead to dehydration – this is common to see with individuals who are not experienced in the cold weather environment.

## ***Personal Hygiene***

***Washing/Shaving***

***Oral Hygiene***

***Water Sources***

***Food Sources***

***Nicotine and Alcohol***

***Latrines***

***Clothing***

***Sleeping Bags***

<b>ELO F</b>	<b>ACTION</b>	Define dehydration and describe the prevention, symptoms, and treatment of dehydration
	<b>CONDITION</b>	In a classroom environment
	<b>STANDARD</b>	Define dehydration and describe the prevention, symptoms, and treatment of dehydration IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

#### Learning Step/Activity 1 – Dehydration

a. (Slide 13) In a cold weather environment, you may notice a marked increase in urine output (due to shell/core and cold diuresis). You may not feel thirsty (due to cold diuresis). Overdressing in the cold weather environment is another common contributor to dehydration due to increased fluid loss from perspiration.

**Dehydration is a major contributor to cold weather injuries.**

## ***Dehydration***

<b>What is it?</b> Excessive loss of body fluids. In a cold environment, results from the shell/core effect and cold diuresis or overdressing.	<b>Symptoms:</b> Headache, Dizziness, Rapid heartbeat, Painful urination Constipation, Lack of appetite, Darkening of urine, Fatigue
<b>Prevention:</b> Drink 3.5-5 quarts of water per day. A way to determine if fluid intake is adequate is to monitor the color of urine – light to straw colored is good; dark brown is trouble.	<b>Treatment:</b> Replace lost water. Liquids should be replenished slowly, not in large quantities. In extreme cases medical treatment and IV fluid replacement may be necessary.

13

**ELO G**

<b>ACTION</b>	Define hypothermia and describe the prevention, symptoms, and treatment of hypothermia
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define hypothermia and describe the prevention, symptoms, and treatment of hypothermia IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

## Learning Step/Activity 1 – Hypothermia

a. (Slide 14) Excessive heat loss from exposure to a low ambient temperature, wetness, high humidity and wind. Mild cases can be treated in the field. Severe cases must be evacuated ASAP. Moving a patient with severe hypothermia can kill them from ventricular fibrillation (all of the muscle fibers spasm out of sync, the heart fails to pump blood and the person dies).

<b><i>Hypothermia</i></b>	
<b>What is it?</b> Excessive heat loss from exposure to a low ambient temperature, wetness, high humidity and wind.	<b>Symptoms:</b> In mild cases: uncontrollable shivering, body temperature of 90-96° F and altered mental state (irrational thought patterns); false sense of warmth; personality changes In severe cases: lack of shivering, body temperature below 90° F and a severely altered mental state
<b>Prevention:</b> Apply the COLD principles; proper wear of ECWCS; anticipate the need for warming shelters, change of clothing etc.; adequate hydration and nutrition	<b>Treatment:</b> In mild cases, reduce the cold challenge and add heat (change to dry clothing, get into warming shelter, sleeping bag etc.); have the individual exercise; provide food and warm liquids. In severe cases you must evacuate the individual to definitive care.

**ELO H**

<b>ACTION</b>	Define chilblain and describe the prevention, symptoms, and treatment of chilblain
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define chilblain and describe the prevention, symptoms, and treatment of chilblain IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

## Learning Step/Activity 1 – Chilblain

a. (Slide 15) This injury DOES NOT involve freezing of tissue. Condition resulting from excessive exposure to cold temperature, marked by inflammatory swelling of hands and feet accompanied by severe itching and burning sensations, and sometimes ulceration; usually affects individuals with a history of cold limbs in summer as well as in winter.

## ***Chilblain***

**What is it?** Condition resulting from excessive exposure to cold temperature, marked by inflammatory swelling of hands and feet accompanied by severe itching and burning sensations, and sometimes ulceration; usually affects individuals with a history of cold limbs in summer as well as in winter.

**Symptoms:** Swollen red tissue (in light skinned individuals) or darkening of the skin (in darker skin types).

This injury DOES NOT involve freezing of tissue.

**Prevention:** Proper wear of clothing; proper hydration and nutrition

**Treatment:** Warm affected area with direct body heat; do not massage or rub affected area, do not wet the area or rub it with snow or ice; do not expose affected area to open fire, stove or any other intense direct heat source

---

**ELO I**

<b>ACTION</b>	Define frostbite and describe the prevention, symptoms, and treatment of frostbite
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define frostbite and describe the prevention, symptoms, and treatment of frostbite IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

---

**Learning Step/Activity 1 – Frostbite**

a. (Slide 16) This injury involves freezing of body tissue. Frostnip or superficial frostbite is the loss of circulation due to freezing of the superficial layers of the skin. If it is caught in this stage there is generally no permanent damage. It generally will appear white or gray (pink or red in dark skinned individuals) and will feel cold and stiff to the touch. The area will remain pliable enough to move over underlying layers. It responds well to field treatment of re-warming. It will be painful, red, tender and mildly inflamed but no blistering will occur. The skin will be more susceptible to further cold weather injury.

In deep frostbite, the tissue freezes to a deeper level. The area is white or bluish and firm to the touch. The area will not move over underlying bone, tendons or muscle. There is a complete loss of sensation and the area typically feels like a club to the affected individual. Ice crystals are typically present on the surface. Re-warming is painful and can cause further damage if not done properly, so evacuation to professional care is usually the recommended course of action. Re-warmed tissues do not look or feel normal. There will be mild to severe swelling and blistering. There is usually tissue death involved – this will be dark blue or black.

Frostbite is insidious. It can sneak up on an individual without them even knowing it. Leaders should assign buddy teams and perform frequent checks. Look at the individual – white patches on extremities are one indicator of superficial frostbite. Push or gently squeeze areas like fingers and toes. This pushes the blood out. In a healthy individual the white color should be replaced by red almost immediately as the body part fills with blood again (capillary re-fill). If there is a problem the blood will be slow to return. This is the time to add clothing (e.g. gloves to mittens) and cover exposed skin (e.g. putting the balaclava down). Skin to skin contact or exercising the extremity (e.g. wind mill the arms until blood flow returns) can also help to warm the area.

If the tissue is re-warmed (superficial frostbite) or will thaw (deep frostbite), a hot water bath should be used (102-105 F). Immerse the injury in this bath for about ½ hour to one hour, then loosely bandage with sterile dressing. Do not allow the individual to use the injured body part, and do not allow the injury to re-freeze. Evacuate as soon as possible in the case of extensive superficial or any deep frostbite. Most often this will mean air evacuation.

---

## ***Frostbite***

**What is it?** Freezing of body tissue. The ambient temperature **MUST** be below 32° F in order for frostbite to occur.

Superficial (frostnip) – only the outer layer of skin is affected

Deep – more tissue involved; can be down to and include bone

**Prevention:** Proper wear of clothing; use contact gloves to handle equipment; use approved gloves to handle POL products; keep face and ears covered and dry; avoid tight, restrictive clothing; adequate hydration and nutrition; avoid alcohol and tobacco products

**Symptoms:** Superficial frostbite (frostnip) – waxy, white or gray skin (pink or red in dark skinned individuals) pliable underlying layers; Deep frostbite - the tissue is white or bluish and firm to the touch and will not move over underlying layers.

**Treatment:** Superficial - Field treatment is to warm affected area with direct body heat or use water at temp of approx 105° F; once thawed, do not allow tissue to re-freeze; Deep - **DO NOT** thaw the injury, if thawing occurs do not allow to re-freeze or bear weight; evacuate  
NEVER moisten or rub with snow/ice; do not expose to intense heat source

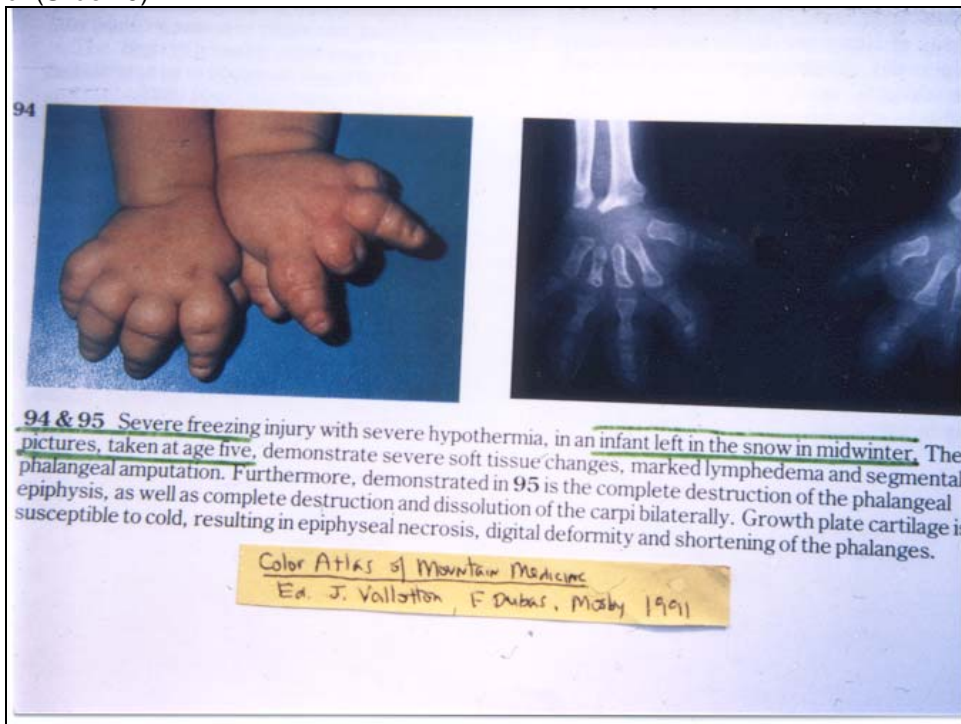
b. (Slide 17) Superficial frostbite



c. (Slide 18) Another view of the same individual with superficial frostbite



d. (Slide 19)



e. (Slide 20) A bleb or bleb blister – signs of deep frostbite

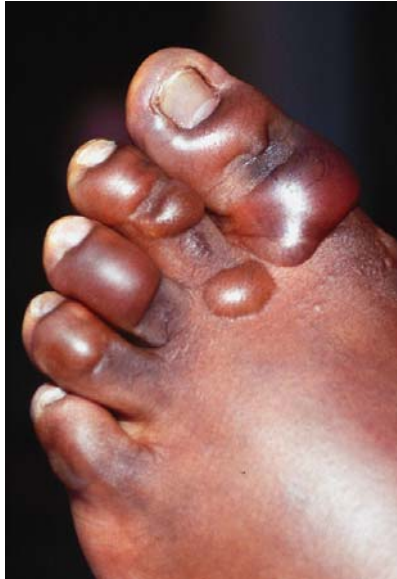


f. (Slide 21) Superficial frostbite – darker skinned individuals





g. (Slide 22) Deep frostbite



20

h. (Slide 23) Deep frostbite 6-8 weeks after the injury occurred – note that the black tissue is dead – this individual will lose a large portion of both feet



21

---

i. (Slide 24) Deep frostbite from fuel spilled on the hand – picture also taken a number of weeks after the injury occurred.



22

<b>ACTION</b>	Define immersion foot and describe the prevention, symptoms, and treatment of immersion foot
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define immersion foot and describe the prevention, symptoms, and treatment of immersion foot IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

### Learning Step/Activity 1 – Immersion Foot (Trench Foot)

a. (Slide 25) Prolonged exposure to cold wet conditions. Inactivity and damp socks and boots speed onset and severity. Improper wear VB boots (not wiping them out and changing socks) is a common cause of this condition. Attempt to give feet a 2-4 hour dry out period each day.

## ***Immersion Foot***

<b>What is it?</b> Prolonged exposure to cold wet conditions. Inactivity, damp socks and boots speed onset and severity.	<b>Symptoms:</b> Cold, numb feet; may progress to hot with shooting pains; swelling, redness and bleeding in severe cases.
<b>Prevention:</b> Keep feet warm, clean and dry with frequent sock changes; wet socks should be dried out ASAP to allow them to be re-used; wipe VB boots out once per day (minimum); dry boots overnight by stuffing with paper towels	<b>Treatment:</b> Re-warm and dry feet by exposing to warm air; do not allow victim to walk on injury; do not rub, moisten or expose area to extreme heat; evacuate

23

b. (Slide 26) Too long in a pair of VB boots without a sock change



24

---

c. (Slide 27) Note the cracking and drying of the skin after the boots are removed



25

---

d. (Slide 28)



26

e. (Slide 29) A severe case prior to skin peeling and sloughing off.



28

f. (Slide 30) Another look at a severe case. Skin is dried out and has begun to slough off.



27

ELO K

<b>ACTION</b>	Define snow blindness and describe the prevention, symptoms, and treatment of snow blindness
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define snow blindness and describe the prevention, symptoms, and treatment of snow blindness IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 – Snow blindness

a. (Slide 31) Burning of the cornea of the eye by exposure of the eyes to intense UV rays of the sun in a snow-covered environment.

## ***Snow Blindness***

<b>What is it?</b> Burning of the cornea of the eye by exposure of the eyes to intense UV rays of the sun in a snow-covered environment.	<b>Symptoms:</b> Pain, red eyes, watery or gritty feeling in the eyes.
<b>Prevention:</b> Sunglasses or goggles in a snow covered environment; improvise slit glasses in a survival situation	<b>Treatment:</b> Rest and total darkness for 24-36 hours; evacuate if no improvement after this time.

31

b. (Slide 32) Two examples of a way to reduce exposure to the sun in the absence of sunglasses – one is made with webbing and 550-cord, the other with a piece of birch bark.

## ***Improvised Slit Glasses***



30

ELO L

<b>ACTION</b>	Define carbon monoxide poisoning and describe the prevention, symptoms, and treatment of carbon monoxide poisoning
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define carbon monoxide poisoning and describe the prevention, symptoms, and treatment of carbon monoxide poisoning IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 – Carbon Monoxide Poisoning

a. (Slide 33) Replacement of oxygen with carbon monoxide in the blood stream caused by breathing fumes from improperly ventilated heat sources.

## ***Carbon Monoxide Poisoning***

<b>What is it?</b> Replacement of oxygen with carbon monoxide in the blood stream caused by breathing fumes from improperly ventilated heat sources.	<b>Symptoms:</b> In mild cases headache, confusion, tiredness, excessive yawning; in severe cases cherry red lips (grey in dark skinned individuals), unconsciousness
<b>Prevention:</b> Use only Army approved heaters in sleeping areas and ensure that all personnel (to include fire guards) are properly licensed on stove; never sleep in running vehicles; always post fire guard when operating heaters in sleeping areas	<b>Treatment:</b> Move to fresh air; CPR if needed; evacuation

31



---

ELO M

<b>ACTION</b>	Define altitude illness
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define altitude illness IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 – Altitude Illness

a. (Slide 34)

### ***Altitude Illness: What is it?***

- **Adverse affects of altitude on the human body**
- **Altitude Illness comprises ALL the problems associated with not feeling well at altitude**

32



---

ELO N

<b>ACTION</b>	Define commonly used altitude classifications
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define commonly used altitude classifications IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 – Altitude Illness

a. (Slide 35)

## ***Altitude Classifications***

- **Altitude: 8,000-12,000**
- **High altitude: 12,000-18,000**
- **Extreme altitude: 18,000-29,000**

*Reference: Medicine for Mountaineering, 5<sup>th</sup> edition by James A. Wilkerson, M.D.*

- **Low: Sea Level to 5,000 feet**
- **Moderate: 5,000-8,000 feet**
- **High: 8,000-14,000 feet**
- **Very High: 14,000-18,000**
- **Extreme: 18,000 and higher**

*Reference: FM 3-97.6 Mountain Operations*

<b>ACTION</b>	Define the relationship between altitude and oxygen available to the human body
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define the relationship between altitude and oxygen available to the human body IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 – Altitude and available oxygen

a. (Slide 36)

21% of the air is oxygen despite the altitude. But the air pressure falls as elevation increases – this decreased partial pressure of (Column 3) is the reason that less oxygen gets to your lungs. The most important measurement is SaO<sub>2</sub> or the percent of your blood that is saturated with oxygen. As altitude increases, the percent of O<sub>2</sub> saturation falls. And since we need O<sub>2</sub> to survive, less of it available means you suffer more. We will talk more about this suffering later.

## Altitude Overview

- At all altitudes the air is made up of 21% oxygen
- As you gain altitude the air pressure drops
- Less oxygen is available to the body because of this reduced pressure
- Less oxygen available means you suffer the effects of altitude

Altitude	BarP	PIO <sub>2</sub>	PaO <sub>2</sub>	PaCO <sub>2</sub>	SaO <sub>2</sub>
0	760	149	94	41	97
5,000	630	122	75-81	39	92
7,500	570		69-74	31-33	92-93
15,000	425	76	48-53	25	86
18,000	379	69	40	29	76
20,000	352	63	37-45	20	71
25,000	291		32-39	13	68
29,000	253	42	26-33	9.5-13.8	58

BarP: barometric pressure

PIO<sub>2</sub>: pressure of inhaled oxygen

PaO<sub>2</sub>: arterial oxygen pressure

PaCO<sub>2</sub>: arterial carbon dioxide pressure

SaO<sub>2</sub>: percent of arterial oxygen saturation

36

<b>ACTION</b>	Describe the initial physiological response to altitude
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Describe the initial physiological response to altitude IAW the Cold Weather or Mountain Operations Handbook.

Learning Step/Activity 1 – Initial physiological response to altitude

a. (Slide 37)

1. You breathe deeper and faster. Even slight exertions may leave you breathless.
2. We saw the chart...O<sub>2</sub> levels in the blood drop as you go up.
3. Your blood becomes more alkaline due to the increase in the breathing rate and depth (another way of looking at it is that more CO<sub>2</sub> is washed out of the blood from the increase in breathing rate and depth). This produces some of the symptoms of altitude illness.
4. Your pulse will race and your heart will pound the harder you go.
5. The volume of blood will decrease due to leaky vessels (from the reduced pressure). This is compounded by dehydration which is typical of operating at altitude. Now your blood is harder to pump because it is thicker and your heart has to work even harder.
6. During sleep, respirations may slow or even stop for a few seconds followed by a rapid increase in respirations and possibly waking. This is a normal body response, but it may increase the problems with adjusting to altitude.

### ***Initial Physiological Response to Altitude***

- ***Increased rate and depth of breathing***
- ***Decreased oxygen saturation***
- ***Changes in pH***
- ***Pulse Rate and Cardiac Output***
- ***Blood Volume***
- ***Sleep Hypoxia***

---

**ELO Q**

<b>ACTION</b>	Describe the acclimatization process
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Describe the acclimatization process IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

---

## Learning Step/Activity 1 – Acclimatization Process

a. (Slide 38)

1. You breathe deeper – to get more O<sub>2</sub> to the lungs. Respiration rate will increase to a lesser degree.
  2. The blood pressure in your lungs increases. This tends to open up more capillaries - parts of the lung that may not normally be used at sea level are utilized. Again this will get more O<sub>2</sub> into the blood.
  3. The volume of blood pumped by the heart increases.
  4. The lack of O<sub>2</sub> stimulates the production of more red blood cells. Technically it stimulates the release of erythropoietin which is produced in the lungs and kidneys. This is a powerful hormone that stimulates the bone marrow to produce more red blood cells.
  5. The blood releases the O<sub>2</sub> it carries more efficiently satisfying the organs that need it (especially those muscles).
  6. Increased capillaries within muscles, an increase in the intramuscular O<sub>2</sub> carrying proteins, an increase in the size of the cell powerhouses (mitochondria).
  7. It can take a few days to many weeks for this process to occur. It varies in individuals and there are no tests that can be done to indicate how well a person will perform at altitude. It should be noted that the body will adjust to altitude, but will NEVER adjust to allow the same performance experienced at sea level.
- 

## ***Acclimatization***

- ***Increased Respiratory Volume***
- ***Increased Pulmonary Artery Pressure***
- ***Increased Cardiac Output***
- ***Increased Number of Red Blood Cells***
- ***Changes in Oxygen-Carrying Capacity***
- ***Changes in Body Tissues***

**ELO R**

<b>ACTION</b>	Define acute mountain sickness and describe the prevention, symptoms, and treatment of acute mountain sickness (AMS)
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define acute mountain sickness and describe the prevention, symptoms, and treatment of acute mountain sickness (AMS) IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

## Learning Step/Activity 1 – AMS

a. (Slide 39) A collection of non-specific symptoms that can resemble the flu, carbon monoxide poisoning or a hangover. Typically occurs at altitudes above 8,000 feet.

Diamox (Acetazolamide) is a sulfa-drug that is often prescribed for persons visiting higher altitudes. It is not a magic pill and because it is a sulfa-drug, those allergic to sulphites cannot take it (like an allergy to red wine). It aids in acclimatization by increasing CO<sub>2</sub> levels in the blood, thus restoring the proper blood pH. It does this by causing you to excrete more bicarbonates in your urine. It has also been shown to normalize breathing during sleep; this in turn helps with a better nights sleep and thus better performance during waking hours. Starting the drug prior to ascending can help determine individuals that may be allergic. 125-250 mg twice daily is the recommended dosage.

## ***Acute Mountain Sickness***

<b>What is it?</b> A collection of non-specific symptoms that can resemble the flu, carbon monoxide poisoning or a hangover. Typically occurs at altitudes above 8,000 feet.	<b>Symptoms:</b> Dizziness, shortness of breath, headache, insomnia, upset stomach, depression
<b>Prevention:</b> Maintain a slow ascent rate. Work high and sleep low – altitude increases of greater than 1000' per day are not recommended; some prescription medications can aid acclimatization; adequate hydration and nutrition	<b>Treatment:</b> Slow ascent rate; rest; aspirin or other OTC meds may help; eat and ensure individual is hydrated; Diamox may help

**ELO S**

<b>ACTION</b>	Define High Altitude Pulmonary Edema (HAPE) and describe the prevention, symptoms, and treatment of HAPE
<b>CONDITION</b>	In a classroom environment.
<b>STANDARD</b>	Define High Altitude Pulmonary Edema (HAPE) and describe the prevention, symptoms, and treatment of HAPE IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

## Learning Step/Activity 1 –HAPE

a. (Slide 40) Lungs fill with fluid (blood serum) that leaks from capillaries. Also known as dry land drowning - as the lungs fill with fluid the individual begins to lose the ability to get oxygen into the bloodstream.

### ***High Altitude Pulmonary Edema***

**What is it?** Lungs fill with fluid (blood serum) that leaks from capillaries. Also known as dry land drowning - as the lungs fill with fluid the individual begins to lose the ability to get oxygen into the bloodstream.

**Symptoms:** In the early stages shortness of breath during exertion and an infrequent cough; as it develops shortness of breath at rest, gurgling respirations (rales), and a frequent cough that produce pink or white frothy sputum; fever; looks similar to pneumonia

**Prevention:** Maintain a slow ascent rate. Work high and sleep low – altitude increases of greater than 1000' per day are not recommended; some prescription medications can aid acclimatization; adequate hydration and nutrition

**Treatment:** Rapid descent of 2000-4000' immediately; oxygen, medications or Gamow bag may temporarily help but rapid descent is the only definitive treatment; Diamox helpful in early stages

38

**ELO T**

<b>ACTION</b>	Define High Altitude Cerebral Edema (HACE) and describe the prevention, symptoms, and treatment of HACE
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define High Altitude Cerebral Edema (HACE) and describe the prevention, symptoms, and treatment of HACE IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

## Learning Step/Activity 1 –HACE

a. (Slide 41) In mild cases, OTC medications can help with the headache and nausea. If symptoms are not relieved, descent must be considered as rapidly as possible. Decadon (a steroid) can help with symptoms, but will only provide temporary relief. The Gamow bag may also provide relief from symptoms long enough to get the individual down under his/her own power.

### ***High Altitude Cerebral Edema***

<b>What is it?</b> Increased intracranial pressure (swelling of the brain), caused by fluid leaking from capillary leakage.	<b>Symptoms:</b> Headache, nausea, dizziness, loss of appetite, fatigue and insomnia ; in severe cases a severe headache and vomiting
<b>Prevention:</b> Maintain a slow ascent rate. Work high and sleep low – altitude increases of greater than 1000' per day are not recommended; some prescription medications can aid acclimatization; adequate hydration and nutrition	<b>Treatment:</b> Rapid descent of 2000-4000' immediately; oxygen, medications or Gamow bag may temporarily help but rapid descent is the only definitive treatment; Dexamethasone (Decadron) may help with symptoms but is only temporary

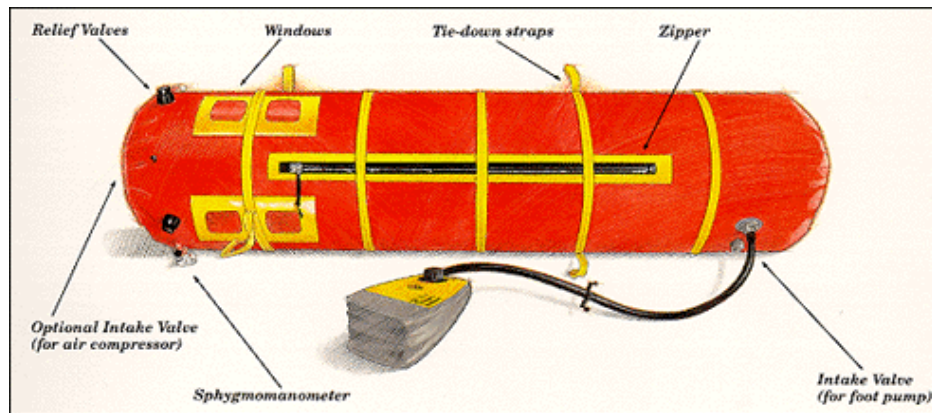
**ELO U**

<b>ACTION</b>	Describe the Gamow bag and how it can be used to treat altitude sickness
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Describe the Gamow bag and how it can be used to treat altitude sickness IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

## Learning Step/Activity 1 –Gamow Bag

a. (Slide 42) This is essentially a hyperbaric chamber. It can 'lower' the altitude by 3000-5000 feet and cause HAPE, HACE or AMS symptoms to subside for up to 12 hours though usually the effect only lasts for 3-5 hours. Still this can allow the patient to self-evacuate to a lower altitude. Though this sounds minor, those who have operated at altitude know how difficult a Medical Evacuation without air support can be. It generally takes 2-6 hours for the symptoms of altitude illness to subside once the system is pressurized. It weighs about 15 pounds.

### ***Gamow Bag***





<b>ACTION</b>	List tips for successful operations at altitude
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	List tips for successful operations at altitude IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 –Tip for Operations at Altitude

a. (Slide 43) If possible, don't fly or drive to high altitude. Start below 10,000 feet (3,048 meters) and walk up.

If you do fly or drive, do not over-exert yourself or move higher for the first 24 hours.

If you go above 10,000 feet (3,048 meters), only increase your altitude by 1,000 feet (305 meters) per day and for every 3,000 feet (915 meters) of elevation gained, take a rest day.

"Climb High and sleep low." This is the maxim used by climbers. You can climb more than 1,000 feet (305 meters) in a day as long as you come back down and sleep at a lower altitude.

If you begin to show symptoms of moderate altitude illness, don't go higher until symptoms decrease ("Don't go up until symptoms go down").

If symptoms increase, go down, down, down!

Keep in mind that different people will acclimatize at different rates. Make sure all of your party is properly acclimatized before going higher.

Stay properly hydrated. Acclimatization is often accompanied by fluid loss, so you need to drink lots of fluids to remain properly hydrated (at least 3-4 quarts per day). Urine output should be copious and clear.

Take it easy; don't over-exert yourself when you first get up to altitude. Light activity during the day is better than sleeping because respiration decreases during sleep, exacerbating the symptoms.

Avoid tobacco and alcohol and other depressant drugs including, barbiturates, tranquilizers, and sleeping pills. These depressants further decrease the respiratory drive during sleep resulting in a worsening of the symptoms.

Eat a high carbohydrate diet (more than 70% of your calories from carbohydrates) while at altitude.

The acclimatization process is inhibited by dehydration, over-exertion, and alcohol and other depressant drugs.

### ***Tips for Operations at Altitude***

***•Driving or flying to altitudes above 10,000 feet is not recommended; it will take 24-72 hours to adjust if you do fly to altitudes above 10,000 feet***

***•Stay properly hydrated...you can lose up to 4 liters per day just breathing...think about water sources, and the resources required to make the water drinkable (filters, stoves, iodine etc.)***

***•High carbohydrate diets are recommended***

***•If an individual shows symptoms of altitude illness, you cannot take that person to a higher altitude until the symptoms have subsided; if the symptoms worsen, it is time to evacuate that individual to a lower altitude. Even a wait of a few hours can mean the difference between life and death.***

## ***Tips for Operations at Altitude***

- 24-72 hours after arrival at altitude, begin a PT program that will mimic the operations you will be conducting; if possible train at higher altitudes and sleep at lower altitudes***
- Diamox can help but may not be appropriate for all individuals***
- Tobacco, alcohol, dehydration, depressant drugs and over-exertion will inhibit acclimatization***
- Remember that you and your soldiers will never be able to perform to sea level capacity; everything will take longer to accomplish***

44

### **ELO W**

<b>ACTION</b>	Define giardia and describe the prevention, symptoms and treatment for giardia
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define giardia and describe the prevention, symptoms and treatment for giardia IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 –Tip for Operations at Altitude

a. (Slide 45) A protozoan parasite commonly found in backcountry water sources.

## ***Giardia***

<b>What is it?</b> A protozoan parasite commonly found in backcountry water sources.	<b>Symptoms:</b> Abdominal pain, intense nasuea, intestinal gas, diarrhea, weakness, loss of appetite
<b>Prevention:</b> Treat all suspect water sources by boiling, chemical treatment or filtration.	<b>Treatment:</b> Hydration, I.V. fluids, medications, evacuation

43

ELO X

<b>ACTION</b>	Define constipation and describe the prevention, symptoms and treatment for constipation
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define constipation and describe the prevention, symptoms and treatment for constipation IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 – Constipation

a. (Slide 46) Infrequent or difficult passage of stool caused by dehydration, dietary patterns, and ignoring nature's call.

## ***Constipation***

<b>What is it?</b> Infrequent or difficult passage of stool caused by dehydration, dietary patterns, and ignoring nature's call.	<b>Symptoms:</b> Abdominal pain, abdominal rigidity, painful defecation, cramping, loss of appetite, headache
<b>Prevention:</b> Adequate hydration and nutrition; heed nature's call	<b>Treatment:</b> Manual removal, clinical spoon, surgery

44

<b>ACTION</b>	Define heat exhaustion and describe the prevention, symptoms and treatment for heat exhaustion
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define heat exhaustion and describe the prevention, symptoms and treatment for heat exhaustion IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

### Learning Step/Activity 1 – Heat Exhaustion

a. (Slide 47) This is early volume shock caused by dehydration. Nausea, vomiting, headache, dizziness, restlessness and even a brief loss of consciousness are common. Profuse sweating and/or skin color changes are variable. Adequate hydration, appropriate clothing adjustments and moderated physical exertion in hot conditions are the most reliable way to prevent heat exhaustion. A person with heat exhaustion should lie down in a cool shady place with the feet elevated. Fluid replacement with cool water and/or IV treatment. OSR (electrolyte replacement drinks), type therapies will help with the re-hydration process. Normal urine output and a rest period of 6-12 hours are required before returning to physical activity.

## ***Heat Exhaustion***

<b>What is it?</b> Early volume shock caused by dehydration. The core temperature is generally NOT elevated.	<b>Symptoms:</b> Weak, thirsty, and nauseated; vomiting is common; pulse and respiration rates will be higher; temperature is normal or slightly elevated; mildly altered mental status
<b>Prevention:</b> Drink before you become thirsty; keep up with the demands for water (3.5- 5 quarts per day); clothing adjustments; moderate physical exertion in hot climates	<b>Treatment:</b> Stop physical exertion; assist evaporative cooling with cool water on the skin; re-hydrate (IV treatment is best); it may take up to twelve hours to bring the individual back to normal

**ELO Z**

<b>ACTION</b>	Define heat stroke and describe the prevention, symptoms and treatment for heat stroke
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define heat stroke and describe the prevention, symptoms and treatment for heat stroke IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

## Learning Step/Activity 1 – Heat Stroke

a. (Slide 48) This is a serious life threatening illness. Rectal temperature will be above 104 degrees F. Onset of heat stroke can be sudden and collapse of the individual is common. A severely altered mental state (usually unconsciousness), with convulsions, dry red skin or covered in sweat, dilated pupils, unresponsive to light.

b. This illness involves a shut down of major systems in the body (brain, heart, liver, kidneys). Because of this the individual **MUST** be evacuated immediately. Immediate treatment involves moving the individual to a shaded, cool area, soaking the clothing with water. Wet towels, sheets or other light clothing can also be used. Fan the individual to increase air circulation and evaporation. IV fluids are recommended. Oxygen can be administered if available and body parts should be massaged to help propel cooled blood back into the organs of the body and head. Rebound is common three to four hours after cooling (still another reason for evacuation). There are no drugs that will help with the cooling process.

## ***Heat Stroke***

<b>What is it?</b> Most severe form of heat illness. Rectal temperature above 104° F.	<b>Symptoms:</b> Rapid onset; Collapse; pulse and respiration elevated; skin may be covered in sweat or dry and red; severely altered mental state; unconsciousness; convulsions; dilated pupils that are unresponsive to light
<b>Prevention:</b> Prevention: Drink before you become thirsty; keep up with the demands for water (3.5- 5 quarts per day); clothing adjustments; moderate physical exertion in hot climates	<b>Treatment:</b> Evacuate immediately; move to cool area and shade from direct sunlight; soak clothing with water and fan to increase air circulation and evaporation; IV fluid replacement

ELO AA

<b>ACTION</b>	Define hyponatremia and describe the prevention, symptoms and treatment for hyponatremia
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Define hyponatremia and describe the prevention, symptoms and treatment for hyponatremia IAW the Cold Weather or Mountain Operations Handbook and Medicine for Mountaineering.

Learning Step/Activity 1 – Hyponatremia

a. (Slide 49) This results from an excess intake of water (there are other forms of this illness caused by different mechanisms). The excess water in the system causes an imbalance in electrolytes. The symptoms mimic dehydration, heat exhaustion and heat stroke making it very difficult to diagnose. Forced hydration and intake of large quantities of water over a short period of time is not recommended. If treated as for heat illness, serious brain injury or death can occur. Evacuation must be immediate; misdiagnosis and treatment can lead to death.

## ***Hyponatremia***

<b>What is it?</b> Also known as water intoxication; it is an excess of water that causes an electrolyte imbalance	<b>Symptoms:</b> dizziness; headache; swelling in the hands and feet; nausea, vomiting; altered mental state
<b>Prevention:</b> Monitor water consumption of subordinates; forced hydration of large quantities of water is a causative factor and is not recommended.	<b>Treatment:</b> Evacuate immediately; must be evaluated and treated by a physician.



Method of Instruction: Lecture  
Instructor to student ratio 1:75  
Time of instruction 5 (minutes)  
Media: PowerPoint

---

**Check on Learning**

1. List some ways to limit problems with altitude sickness.  
Reference Slide 39 and 44

2. For any suspected cold weather injury you should:  
a. Have the individual complaining drive on and tough it out.  
b. Have medics look at the individual when you get around to it.  
c. Stop what you are doing and focus on treating that individual immediately.

3. What is the treatment for superficial frostbite?  
Use skin to skin contact to warm the effected area or immerse in a warm water bath of about 102-105 F for one half hour. Wrap the injury loosely with a sterile dressing, do not allow the individual to use the effected are under any circumstance and do not allow the injury to refreeze. Medical personnel should make the decision concerning evacuation. Do not expose to intense direct heat source or rub with snow or ice.

4. What is the treatment for deep frostbite?  
Do not thaw and evacuate to medical facility immediately; if thawing is inevitable, immerse in water of about 102-105 F for one half hour, wrap the injury loosely with a sterile dressing, do not allow the individual to use the effected area under any circumstance and do not allow the injury to refreeze. Evacuate. Do not expose to intense direct heat source or rub with snow or ice.

---

**Review and  
Summarize  
Lesson**

The Terminal Learning Objective for this lesson was:

<b>ACTION</b>	Demonstrate knowledge of medical problems commonly encountered in cold weather/mountain environments, their preventive measures and treatment, and nutritional and hygienic requirements for health maintenance
<b>CONDITION</b>	In a classroom environment
<b>STANDARD</b>	Demonstrate knowledge of medical problems commonly encountered in cold weather/mountain environments, their preventive measures and treatment, and nutritional and hygienic requirements for health maintenance IAW this presentation.

---

**Transition to next  
lesson**

As per NWTC training schedule; dependent upon course in conduct.

---



---

**SECTION V****STUDENT EVALUATION**

---

**Testing  
Requirements**

Students will be tested on their knowledge of medical considerations in a cold weather or mountainous environment during a one hour written examination at the conclusion of the course (Refer to training schedule for date/time of exam).

---

**Feedback  
Requirement**

Instructors and medics will reinforce this lesson by conducting frequent checks of students during field exercises. In addition to ensuring students do not become cold weather injuries, the intent is to show students how to conduct checks of their own soldiers for cold weather injuries.

---